The EU CAP-reform of 2003 and its consequences for German beef farmers

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Summary

Beef production in Europe is among the sectors most affected by the recent CAP-reform. German beef production is mainly based on intensive bull finishing with origin from the dairy herd. The implementation of the CAP-reform varies widely between the member states and the German government opted for a full decoupling of payments and a 'dynamic hybrid payment model'. The historical, individual farm based Singe Farm Payments (SFP) are gradually converted into homogeneous, regionalised acreage payments for both cropland and grassland in the period 2010 to 2013.

The impact of the CAP-reform is shown for two example farms, both sourced from the typical farm sample of the ***agri benchmark*** project. The farm income of the intensive beef finisher in West Germany decreases dramatically over the adjustment period whereas the farm income of the extensive suckler-cow farm in East Germany increases slightly when compared with the Baseline scenario representing the pre-reform Agenda 2000 policy framework. The main reason is that the increasing acreage payments for the cropland does not compensate for the 'loss' of the individual SFP of the intensive finisher whereas the newly introduced grassland premium for the grassland farm compensates the 'loss' of the individual SFP. Rising rent prices will, however, reduce the future farm income.

Based on these findings, farm strategies for a number of intensive finishers were identified, specified and analysed in cooperation with farmers and their advisor. From an income point of view, the stop farming strategy was unfavourable unless surplus family labour can be used in the local labour market. For most of the farms, the moderate growth scenario proved more favourable and superior to the strong growth scenarios. This conclusion was supported when including risk in the analysis. The moderate growth scenario showed among the highest income expectations and the lowest probabilities for making a loss.

Keywords: beef production, EU CAP-reform, policy analysis, farm strategy analysis, risk analysis

Zusammenfassung

Die EU Agrarreform von 2003 und ihre Auswirkungen auf deutsche Rinderproduzenten

Die Rindfleischproduktion in Europa gehört zu den Sektoren, die am stärksten von der aktuellen GAP-Reform betroffen sind. Die Rindfleischproduktion in Deutschland stützt sich auf die Mast von Bullen aus der Milchviehhaltung. Die Umsetzung der Reform differiert deutlich zwischen den Mitgliedsstaaten. Die deutsche Regierung hat sich für eine Vollentkopplung der Prämien und ein „dynamisiertes Kombimodell" für die Auszahlung der Prämien entschieden. Die historischen, betriebsindividuellen Prämien werden schrittweise in regional einheitliche Flächenprämien für Ackerland und Grünland umgewandelt.

Die Auswirkungen der Reform werden anhand von zwei Beispielbetrieben analysiert, die beide aus dem Netzwerk des ***agri benchmark*** stammen. Der Gewinn des intensiven Bullenmästers in Nordrhein-Westfalen sinkt innerhalb der Anpassungsperiode drastisch, während der Gewinn des extensiven Mutterkuhhalters in Mecklenburg-Vorpommern im Vergleich zur Baseline (Agenda 2000) leicht ansteigt. Dies liegt daran, dass die ansteigenden Ackerprämien den Verlust der betriebsindividuellen Prämien beim Intensivmäster nicht kompensieren können, während die Einführung der Grünlandprämien den Verlust der betriebsindividuellen Prämien kompensieren können. Es ist allerdings mit einem Sinken des Gewinns aufgrund steigender Pachtpreise zu rechnen.

Auf der Basis dieser Ergebnisse wurden gemeinsam mit betroffenen Landwirten und ihrem Berater Anpassungsstrategien für Intensivmäster identifiziert, spezifiziert und analysiert. Die Einstellung der Produktion ist unrentabel, wenn die freigesetzte Arbeit nicht auf dem lokalen Arbeitsmarkt verwertet werden kann. Für die meisten Betriebe wäre ein moderates Wachstum die geeignetste Strategie und einem starken Wachstum überlegen. Diese Ergebnisse wurden bestätigt, wenn das Produktions- und Preisrisiko in die Analyse einbezogen wurde. Das Szenario „Moderates Wachstum" ist unter den Szenarien mit den höchsten Gewinnerwartungen und der geringsten Wahrscheinlichkeit, dass ein Verlust auftritt.

Schlüsselwörter: Rindfleischproduktion, EU GAP-Reform, Politikanalyse, Analyse Betriebsstrategie, Risikoanalyse

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1 Introduction

1.1 Situation and objectives

With tariff rates of approximately 90 percent and a sophisticated set of direct payments, beef production in the European Union has been one of the most protected and subsidised agricultural sectors. It is therefore not surprising that the beef finishing and cow-calf sector is among the most affected by the 2003 CAP-reform, also known as Mid Term Review (MTR). This holds particularly true for intensive bull finishers with high stocking rates and limited land availability.

The goals of this paper are to:

- examine how the MTR was implemented in the EU and in Germany,
- analyse the consequences of the reform for different farm types in Germany,
- identify and analyse adjustment strategies for intensive bull finishers, and
- to evaluate the risk involved in the implementation of the adjustment strategies.

1.2 Methods and working steps

Data and information about the characteristics and the implementation of the MTR were obtained from literature review and the European Commission (2005). All farm level and production system information is derived from the ***agri benchmark*** project and related master and diploma theses (Keller, 2006 and Brömmer, 2005). ***agri benchmark*** is a world-wide project of farm economists with participation of farmers and advisors. The main objective is to generate sustainable, comparable, quantified information about farming systems, their economics, their framework conditions and perspectives world-wide.

For quantitative farm level analysis, typical farm data from the ***agri benchmark*** farm sample as well as individual farm data from beef finishers is used. The analysis was performed in close cooperation with producers and advisors, using the farm level simulation model TIPI-CAL. A detailed description of the typical farm approach is provided by Deblitz and Zimmer (2005) as well as on the ***agri benchmark*** website at www.agribenchmark.org. For reflecting risk in the farm strategy analysis, the Excel add-in SIMETAR software developed by James Richardson (Texas A&M University) was used.

The farm level data and results obtained are not representative but reflect a fair proportion of the beef finishing and cow-calf production systems under operation. To allow conclusions about other farm types, general considerations about the impact of the policy and different strategies on different types of farms are provided where relevant.

The following working steps are undertaken: Chapter 2 provides an overview of the German beef production and its situation in Europe. In the next chapters, the implementation of the MTR in the EU (Chapter 3) and in Germany (Chapter 4) is described and reasons for and general consequences of the different ways of implementation are presented. Chapter 5 is dedicated to the consequences of the MTR on beef finishing and cow-calf farms in Germany, based on quantitative analysis of two typical farms taken from the ***agri benchmark*** sample as well as general considerations for further farm types. Based on the results of this chapter, a farm strategy analysis for intensive bull finishing farms is performed in Chapter 6 which is further detailed by reflecting production and market risk in Chapter 7.

2 Status quo of beef production in Germany

Germany's beef production position within Europe can be summarised as follows:

- With a production of approximately 1.3 million tons, Germany is the second largest beef producer in the EU-25 which has a total production of approximately 8 million tons (ZMP, 2006).
- With a per capita consumption of approximately 12.5 kg per year, Germany has the lowest beef consumption in the former EU-15 (ZMP, 2006). Consumption is only lower in the New Member States.
- Germany is a 'milk' country, i.e., 88 percent of the total cow numbers are dairy cows (ZMP, 2006). Thus, the vast majority of the beef produced in Germany is from dairy origin. Main breeds include Holstein (mainly in the north of Germany) and Simmental (mainly in the south of Germany).
- The prevailing production system is bull finishing on a corn (grass) silage plus grains/concentrates/soybean ration in confined barn systems (Brömmer, 2005).
- Productivity levels are rather high with daily weight gains (DWG) of around 1,000 g per day for Holstein bulls and 1,100–1,300 g for Simmental bulls. Final live weights are at 620 kg for Holstein and more than 700 kg for Simmental bulls (Brömmer, 2005).

3 The implementation of the CAP-reform in the EU

The CAP-reform of 2003 (also referred to as Mid Term Review MTR) is a major change in agricultural policy. Main characteristics are:

- The **decoupling** of the direct payments from actual production (beef, suckler-cows, cereals, milk, etc.). This

means that producers receive payments even if they do not produce anymore. Furthermore, payments may not appear as receipts in the beef or cow-calf enterprise anymore, i.e. receipts – and profitability – are reduced by the amount of previously coupled payments. The level of payments is basically based on the annual average of the historic payments received in the years 2000 - 2002.

- The linkage of the payments to the fulfilment of regulations regarding the maintenance and management of the land and environment **(cross compliance)**. If a recipient of payments does not comply with the regulations, payments may be cut or even withdrawn.

These general principles have been modified in many countries of the EU. The result is a co-existence of different ways of implementation, which can be summarised as follows with only those related to beef and cow-calf production:

Payment	Option I	Option II	Option III
Slaughter-premium **calves**	up to 100 %	up to 100 %	up to 100 %
Suckler-cow premium	up to 100 %	0 %	0 %
Slaughter-premium **adult cattle**	up to 40 %	up to 100 %	0 %
Special premium for **male cattle**	0 %	0 %	up to 75 %

Figure 1:

Options for (de)coupling of beef payments in the beef sector (EU-COM, 2005) Note: Percentages indicate the level of coupling

- Some countries have opted for keeping some direct payments partially or fully coupled to the animals maintained or produced. Apart from the full decoupling of payments, member states could choose between three options shown in Figure 1.

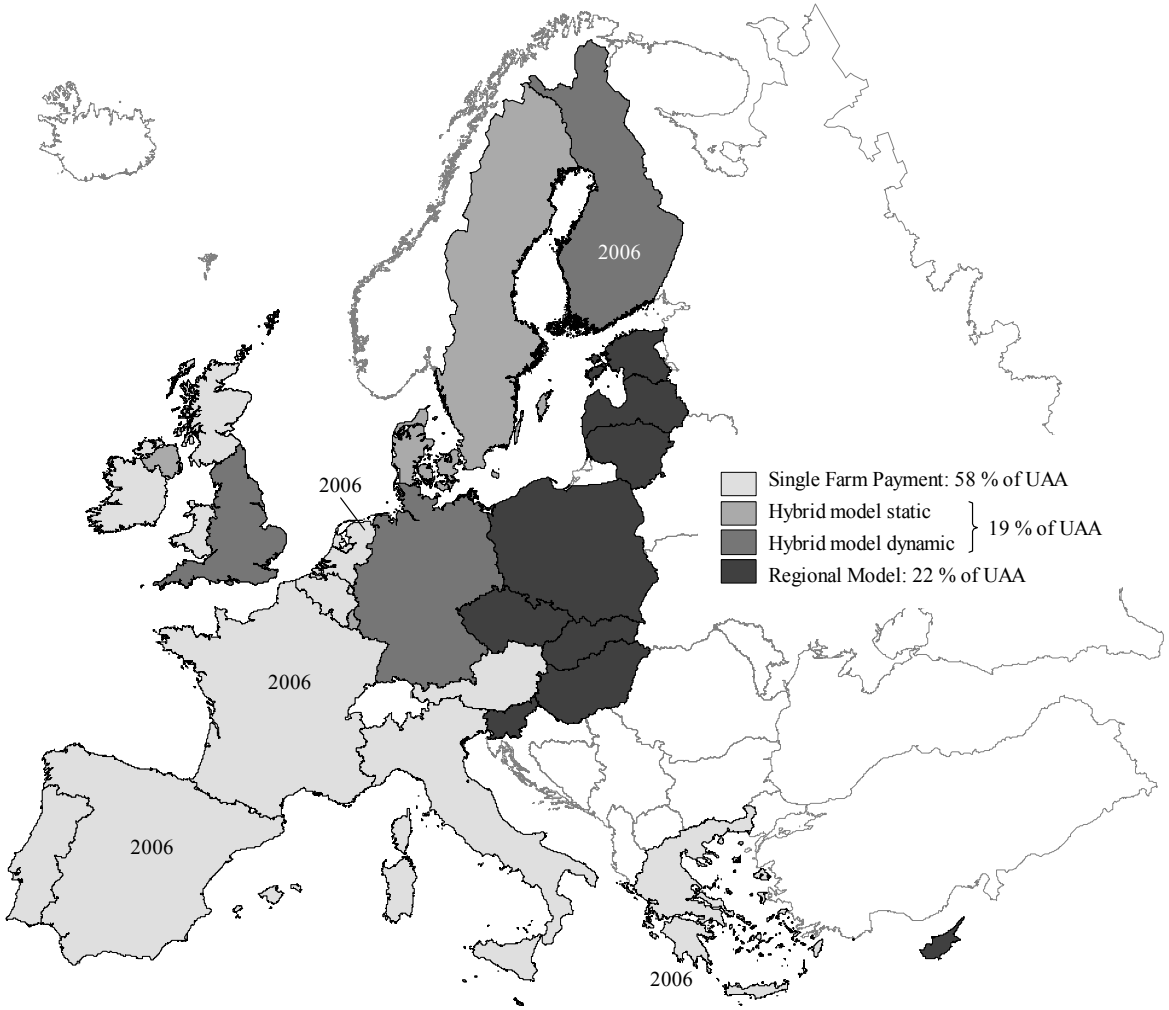

Figure 2:

Payment models and start of the implementation of the CAP-reform in the EU-25 (EU-COM, 2005)

- The basis for paying the decoupled payments varies between a) a 'single farm payment' (SFP, exclusively based on the farm-individual historic payments), b) an acreage based payment (homogeneous payment for all land in one region, mainly in the new member states) or c) a hybrid model which is a mixture of the previous two payment systems. The hybrid (or combi) model can be static (relation between acreage payment and SFP remains constant over time) or dynamic (the SFP is phased out in favour of the acreage payment).
- The start year of the implementation was 2005 for all countries with the exception of France, Spain, Netherlands, Finland and Greece (2006).

Figure 2 shows the different payment models and the start years and Figure 3 show the different implementation of the (partially) decoupled payments in the EU-25. The pie-charts of Figure 3 contrast the share of each country in the total EU-25 beef production and in the total suckler-cow numbers with the (de)coupling models applied in each country.

As Figure 3 suggests, approximately two thirds of the beef production in Europe is fully decoupled. The majority of the remaining one third continues to receive 40 percent of the slaughter premium as a coupled premium, with all other payments decoupled. Taking the proportion into account that the slaughter premium has had in total of the previously fully coupled situation, this means that in average only 13 percent (bulls), eight percent (steers) and 40 percent (heifers) of the previous payment levels remain. It can be assumed that at least for male animals the low levels of payments remaining coupled will not lead to different decisions about continuation or stopping production when compared with the fully decoupled situation.

Figure 3 also shows that the situation of the cow-calf production is somewhat different. Not taking into account the share of slaughter premiums (rather unimportant for a suckler-cow herd), payments for two thirds of the suckler-cows on EU-level remain fully coupled, mainly because the two dominant suckler-cow countries in Europe, France and Spain, have opted for this. Contrary to the slaughter premiums, the suckler-cow premium is between EURO 180 - 200 per cow, a level that will most likely have a significant impact on the decision whether to continue cow-calf production or not.

4 The implementation of the CAP-reform in Germany

Germany opted for a full decoupling of the direct payments and dynamic hybrid (combi) model as follows:

- For each farmer, a part of the decoupled payments is paid

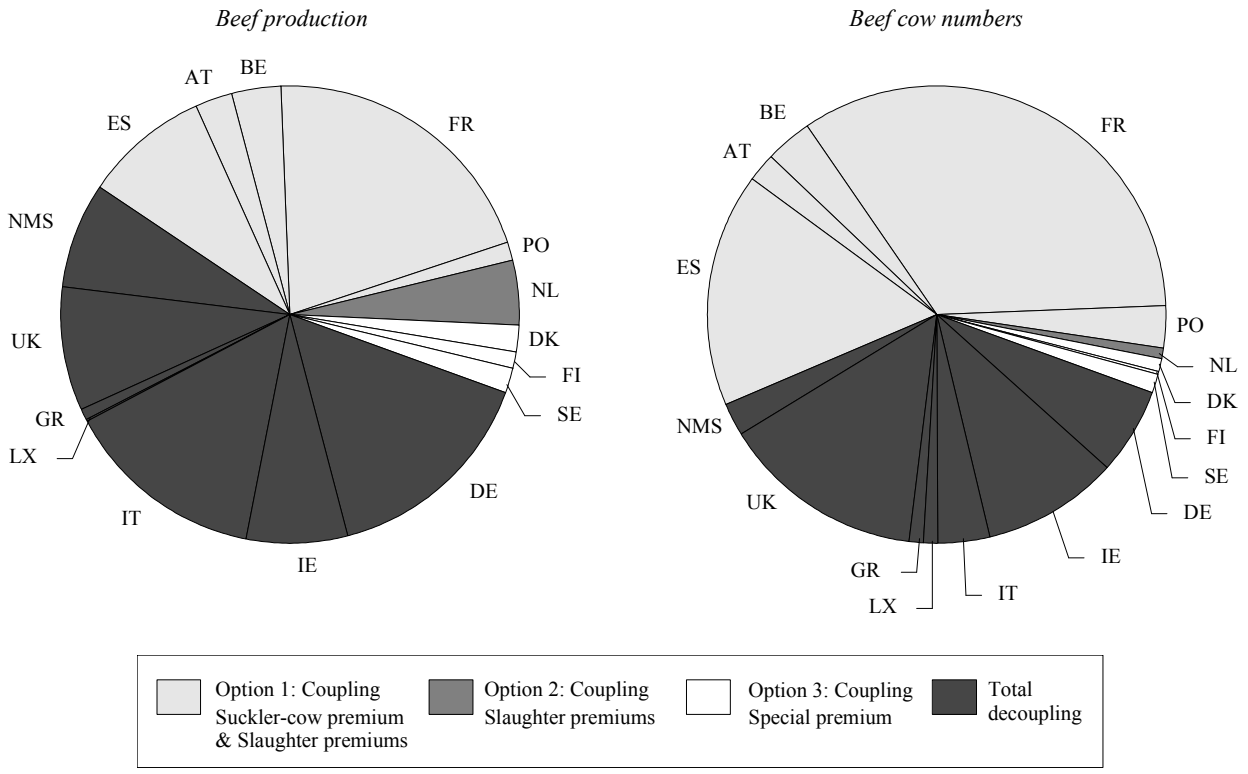

Figure 3:
Beef production and suckler-cow numbers in the EU-25 and (de)coupling models by country (EUROSTAT, agra-europe, 2004)

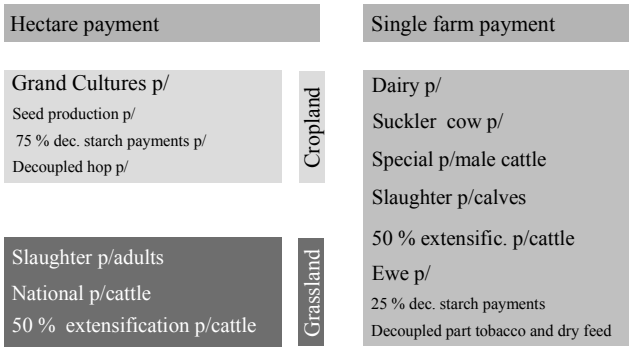

Figure 4:

Conversion of coupled payments into decoupled single farm payments and acreage payments (DBV, 2003)

as a SFP based on the historic payments he received and another part is paid on an acreage basis. Figure 4 shows which part of the formerly coupled payments were converted into SFP, arable and (as a newly introduced payment) grassland payments, respectively.

- The acreage payments are homogenous for defined regions (=Bundesländer) with slight differences between the regions. Further, in the beginning of the implementation, there are different acreage payments for cropland and for grassland (for regionalised acreage payments see Table 1).

From 2005 to 2009, the relation between the SFP and the acreage payments will remain constant. In the four-year period 2010 to 2013 the following two main changes are going to occur in the system:

1. The SFP will gradually be phased out (to zero) in four steps in favour of the acreage payments.
2. The grassland payments will gradually increase until they reach the level of the cropland payments.

As a consequence, in 2013 there will only be homogeneous acreage payments for cropland and grassland while slight differences between the Bundesländer will remain. The initial cropland premium may increase or decrease in that period depending on a) the share of SFP in the total payment amount and b) the share of grassland in the Bundesland. Table 1 shows the development of the acreage payments per Bundesland and Figure 5 illustrates the evolution of acreage payments for cropland and grassland taking Bavaria as an example.

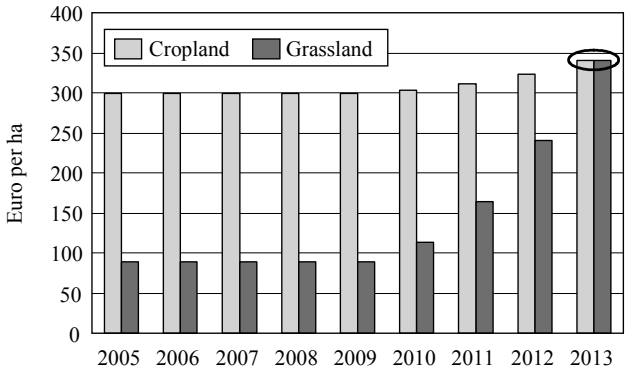

Figure 5:

Evolution of cropland and grassland payments in Bavaria (BMVEL, 2004)

Table 1:

Start and end values of acreage payments by regions (Bundesländer) in Germany (BMVEL, 2004)

Bundesland	2005		2013	2013 vs. 2005
	Grassland	Cropland	Homogeneous Acreage payment	Change of cropland payments
Baden-Wuerttemberg	56	317	302	-
Bavaria	89	299	340	++
Brandenburg	70	274	293	++
Hesse	47	327	302	--
Mecklenburg-Western Pomerania	61	316	322	+
Lower Saxony	102	259	326	+++
North Rhine-Westphalia	111	283	347	+++
Rhineland-Palatinate	50	288	280	-
Saarland	57	296	265	---
Saxony	67	321	349	++
Saxony-Anhalt	53	337	341	+
Schleswig-Holstein	85	324	360	++
Thuringia	61	338	345	+
Germany	**79**	**301**	**328**	**++**

Changes in crop payments relative to their initial values:
– – – much lower, – – moderately lower, – slightly lower, + slightly higher, ++ moderately higher, +++ much higher

The background and intention of policy when designing the German hybrid payment model had three key considerations:

1. **Avoid court cases between neighbours.** In the historic payment situation, the hectare equivalents of the payments received used to be largely heterogeneous between neighbouring crop farms and intensive livestock farms with the same natural conditions. Payment levels were usually around EURO 350 per ha for the cash crop farms and equivalent to EURO 500 - 900 for the beef finishing farms when converting the per head payments received to the hectare. With a SFP only, both neighbours would have maintained these levels of payment which many politicians thought inequitable and may led to legal action if the (possibly former) cash crop farmers would seek the same payment levels as their (possibly former) beef producing neighbours. As a result it was concluded that a homogeneous acreage payment for each hectare of land would be the more viable option.
2. **Minimise liquidity problems of intensive beef farms.** Introducing a homogeneous acreage payment exclusively from the first day of implementation, intensive beef finishers could have suffered from severe liquidity problems because their hectare equivalents would have dropped from the originally, individual high values to the low values as shown in Table 1. Therefore policy opted for the hybrid (combi) model and the phasing out of the SFP after a constant relation between the SFP and the acreage payment for five years (2005 - 2009). This minimises large changes in liquidity and allows intensive livestock farms time to adjust.
3. **Promote grassland.** The then government coalition of social democrats and greens wanted to promote grassland which has never received support from the first pillar measures by introducing a grassland premium. The grassland premium is to increase up to the same level as the cropland premium in the final year of implementation (see Table 1 and Figure 5).

5 Consequences for beef farms in Germany

With decoupled payments, the future profitability of beef finishing and cow-calf production will solely depend on the price relations rather than subsidies. In case that producing beef (or keeping suckler-cows) without direct payments is no longer profitable, one should better stop this form of production.

The profitability of beef farming is additionally influenced by cross-compliance regulations, where land farmed must be kept open to be eligible to receive payments. On flat land this can be done mechanically by mowing/mulching the land once or twice a year at costs of approximately EURO 40 to 60 per hectare for one mowing.

However, stopping farming usually bears some cost as well. Interest and principal for loans must be paid, certain taxes, duties and levies as well as insurances must be reflected and maintenance for buildings must be taken into account, if they can not be sold, alternatively used and if legislation requires to maintain them (for example old buildings). Furthermore, the cost of possible degradation of the land and its restoring should also be reflected in these considerations.

The fulfilment of the cross-compliance regulations is however the reference system for all alternative land uses. On a per-hectare basis, the loss per ha on a total cost basis may not be more than the cost for mowing/mulching the land plus the overhead cost mentioned above. Otherwise mulching would be the better alternative.

2005, in fact, when compared with the previous year, saw a ten percent decline of beef production in Germany with a total of 1,216 million tonnes. In 2006, production raised again slightly to a total of approximately 1,237 million tonnes (plus two percent) (ZMP, 2007). At the same time, beef prices increased significantly and calf prices were on the rise, too, however to a lesser extent, so that the profitability (without direct payments) improved. Additionally, individual payment levels for almost all farms remained rather constant around the level of the year 2004 resulting in higher returns when considering the whole farm level. This means that the economic situation in many farms improved in 2005 compared with 2004.

5.1 Typical farm case studies

Two significantly different typical farms from the German ***agri benchmark*** network were chosen to illustrate the different impact of the CAP-reform on different production systems.

Farm 1: A specialised, intensive **bull finisher** in the West of Germany producing 260 bulls per year on a corn silage, concentrate and soybean ration. Apart from the beef, the farm sells wheat and triticale which are not used for feeding.

Farm 2: A **cow-calf producer** in East Germany with a herd of 1,100 suckler-cows producing baby-beef from weaned calves as well as weaner calves for further finishing on other locations. The farm is 100 percent grassland based and located at the Baltic sea coastal region in North-East Germany.

For both farms, the following analysis was performed:

1. A reference system (Baseline) for comparison with the MTR was defined. The baseline reflects the most likely situation, if the reform hadn't taken place and therefore

would portrait the continuation of the Agenda 2000 policy. It is characterised by the continuation of the coupled payments, constant production and productivity as well as constant prices for beef and calves based on 2004 values as well as increases in general costs such as labour, energy, machines, and general overhead costs. This explains why the farm income decreases over the course of time.

2. Two MTR (CAP-reform) scenarios were calculated both reflecting the decoupling of the payment systems with two different sub-scenarios on prices:
   a) the same price assumptions as in the Baseline, i.e. constant beef and calf prices based on the year 2004. This scenario was calculated to exclusively illustrate the policy-impact albeit it is already passed by price increases reflected in the next sub-scenario:
   b) the same productivity and production assumptions as in the Baseline but reflecting the price increases for beef and calves that took place in 2005, i.e. constant beef and calf prices based on the year 2005.

Figure 6 shows the development of the (whole) farm income of Farm 1 from 2004 to 2013, the year in which the reform is fully implemented. The farm income includes the decoupled payments and therefore does NOT show the profitability of the beef finishing enterprise. The chart shows the comparison between the Baseline and the two MTR-scenarios. There are three main milestones for the development of the farm income:

- **The year 2005.** Without the price increases, the farm income would have been slightly below that of 2004. The reason is that the regionalised acreage payments and the SFP could not compensate for the loss of the previously coupled payments (see Figure 4 for conversion of historic payments). In other words, the total payments received by this farm in 2005 were less than in 2004. In the second MTR-scenario, the profit increases because the price increases for beef compensate for both the decrease of the payments and the increase in the calf prices.
- **The year 2010.** This is the year in which the conversion of the SFP into the acreage payments commences. The total payments (and thus the total returns) decrease significantly because the 'loss' of the SFP can not be compensated by the minor increase of the acreage payments.
- **The year 2013.** In this year, the farm income is approximately EURO 20.000 lower than in the Baseline scenario of the same year.

Figure 7 shows the projection of the (whole) farm income including the decoupled payments for **Farm 2**. It is important to mention that it does therefore NOT show the profitability of the cow-calf enterprise. Again, three milestones are identified:

- **The year 2005.** Without the price increases, the farm income would have been significantly below the income of the year 2004. There are two reasons for this, namely:

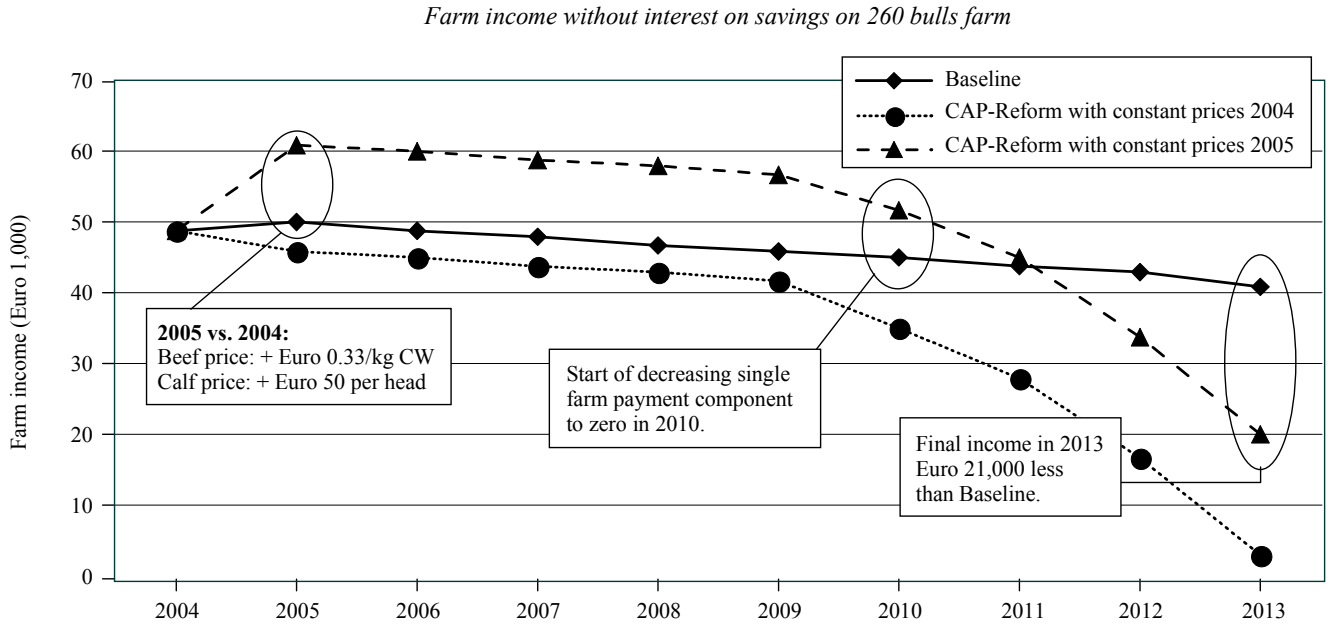

Figure 6:
Development of the farm income (without interest on payments) for an intensive bull finisher with 260 bulls annual production (Keller 2006, modified)

1. The 'loss' of historic payments that have been turned into the regional acreage payments (50 % of the extensification premiums plus the total of all slaughter premiums, adding up to almost EURO 100,000).
2. The new grassland premiums are low in the initial phase of implementation. In other words, the total payments received by this farm in 2005 were significantly less than in 2004. In the second MTR-scenario, the profit increases because the price increases for the weaner calves and beef, thus compensating for the decrease of the payments.

- **The year 2010.** This is when the conversion of the SFP into the acreage payments commences. The result of this transformation is significantly different from Farm 1. The reason is that the share of grassland is 100 percent which until the end of the four years period receives significantly higher premiums every year. As a consequence, the farm income increases in this period.
- **The year 2013.** The farm income in the year 2013 is slightly higher than in the Baseline based on constant prices of the year 2004. In 2013, all grassland of the farm receives an acreage payment of approximately EURO 322 per hectare. With a total (grass)land area of 1,335 hectares this provides a new payment income of almost EURO 500.000, which compensates for the 'loss' of the previously coupled livestock payments. Taking the market price increases in 2005 into account, the farm income is projected to be a further EURO 100,000 higher than in the Baseline.

It should be mentioned that the positive results for the grassland farm can only persist if rent prices remain stable. It can, however, be assumed that the grassland premium which have been implemented as part of the reform, will lead to further substantial increases of rental prices. As this is a long–term aspect it is not discussed further here.

The fact that the overall farm income is likely to be equal or even higher than in the Baseline does not necessarily mean that the continuation of cow-calf production is profitable because the decoupled payments may not be considered as returns of the cow-calf enterprise. The same is generally valid for farms of type 1 analysed here.

5.2 Further conclusions

Cost of production analysis performed in the ***agri benchmark*** project (Deblitz, 2006) suggests that with the decoupling of the payments the mid- and long-term profitability of beef and cow-calf production is not sustained. The fact that the decrease of production to date has been rather moderate, is possibly due to the following:

- Due to the rise in market prices and the fact that the total income in most farms will not significantly decrease until 2009, it can be assumed that a major drop in production can only be expected from 2010 onwards. This reflects the perception on some farms that if the total income remains high, one will continue with current production, despite decoupled payments.
- Given the presently high price levels, the production of beef and weaner calves, in many cases may be profi-

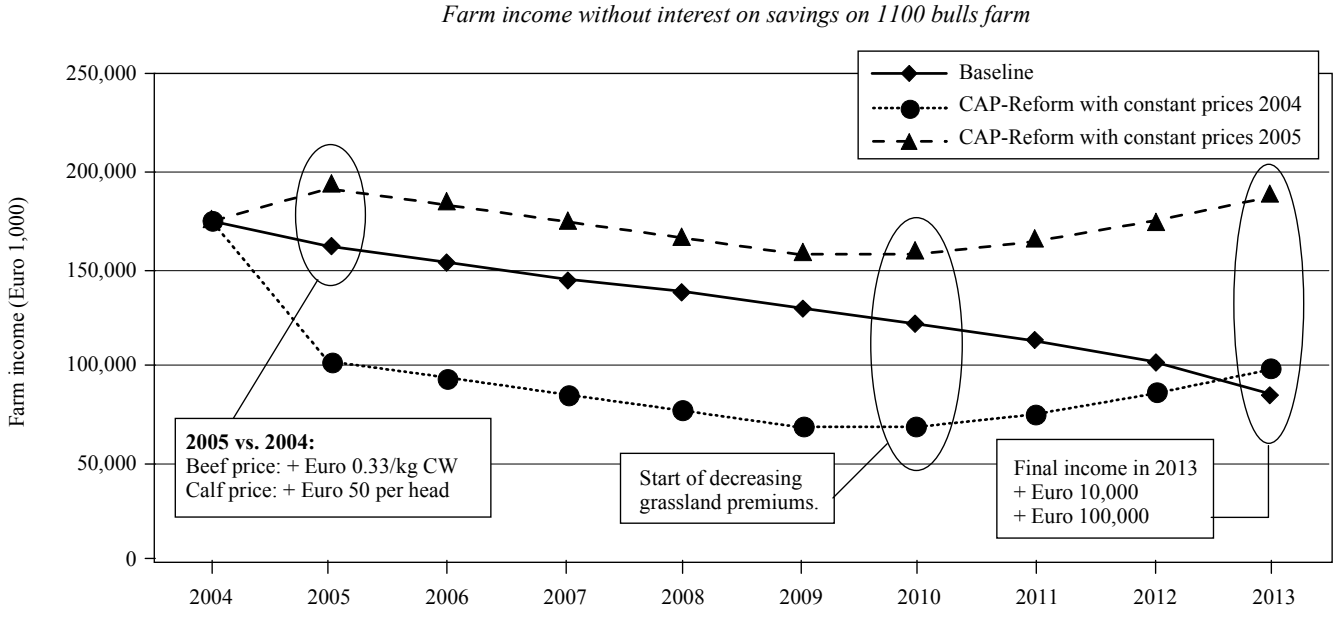

Figure 7:
Development of the farm income (without interest on payments) for a cow-calf producer with 1,100 suckler-cows (own calculations)

table when only considering the marginal (or short-term) costs of production. This changes however as soon as investments have to be made or a long–term perspective is taken.
- As mentioned, giving up production has certain cost, too (see chapter 5 and 6.4, strategy stop).
- Many farmers might wait for others going out of business before they do and thus speculate on higher market prices due to reduced supply.
- Especially for many small cow-calf producers in West Germany, long–term profitability is likely to not be the driving factor for keeping suckler-cows.
- Due to their legal status and social obligations against their employees, a significant number of large farms in East Germany are likely to use a part of the decoupled payments for compensating losses that occur without the decoupled payments.
- Some, especially older farmers, might not have employment alternatives outside of their farm. They might continue farming on a marginal cost approach until they retire.

6 Strategy analysis for intensive bull finishers

The previous chapters illustrated that intensive bull finishers are those who are going to face significant income losses once the SFPs are phased out. In addition, the current expansion of bio-energy plants is going to have a negative impact on the profitability of beef production as it is likely to result in stable or even increasing land prices. Furthermore, an increase of opportunity costs for feeding corn silage to beef cattle can be expected if biogas plants are able to pay above present (forage) market prices. This issue could, however, not be reflected in the following calculations. It is the subject of further research currently conducted within the ***agri benchmark*** project.

Based on the findings of the policy analysis performed above, the next logical step was to consider adjustment strategies and ways to avoid the economic decline which is likely to affect intensive beef production in the near future. This was done in close cooperation with farmers and advisors and using the methods and tools applied in the ***agri benchmark*** project (Keller, 2006).

6.1 Case study farms

Five farms were analysed, all located in the main bull finishing region in the West of Germany, Northrhine-Westphalia. They all run a similar finishing system based on corn silage plus grain / concentrate / soybean ration. To identify possible differences in the policy and farm strategy impacts, different farm sizes, breeds and start age of the finishing animals were chosen. The farms can be characterised as follows with the number indicating the total number of bulls sold per year:

DE-160: Finishing Holstein bulls from calves (14 days old, 55 kg).
DE-160F: Finishing Simmental bulls from stocker cattle (4 months, 175 kg).
DE-260: Finishing Simmental bulls from stocker cattle (4 ½ months, 185 kg).*
DE-320: Finishing Simmental bulls from calves (43 days, 90 kg).
DE-515: Finishing Simmental bulls from stocker cattle (4 months, 166 kg).

Due to the limited scope available in this paper, the farm DE-260 was selected to illustrate the results of the analysis. Whenever significantly different, results for the other farms are mentioned separately but not shown in figures.

6.2 Policy analysis

A policy analysis was performed for all farms, basically yielding the same conclusions as for Farm 1 analysed above, i.e. a dramatic decline of farm income until 2013. Differences among the farms mainly occur depending on the share that the previously historic payments converted into the SFP (i.e., the special premium) had before the reform was implemented. Farms which had a high share of the special premium in the total premiums – mainly those characterised by a relatively low stocking rate compared with their colleagues – are better off at the beginning of the implementation and suffer from bigger premium losses at the end of the transformation of SFP into acreage payments and vice versa.

6.3 Defining strategies

In a feedback procedure with the five farmers and their advisor, possible adjustment strategies were defined which were then analysed for all five farms to ensure comparability of the results between them. All farmers agreed to the five strategies listed below. The strategies were then individually specified for each of the farms. It was agreed that all strategies should be implemented in the year 2006, i.e., one year after the implementation of the reform. The underlying price and policy assumptions were identical with the scenario ‘CAP-reform with constant prices from 2005’ shown in chapter 5.1 (constant prices from 2005 based on a price increase from 2004 to 2005).

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* The results for this farm’s policy analysis were already pointed out in chapter 5.1.

The following strategies were identified:

Strategy 1: **No adjustments:** produce the same number of animals; no changes in the production system (equivalent to the second MTR-scenario in the policy analysis).

Strategy 2: **Stop beef farming in the year 2006:** Animals on the farm stay until they are finished, no new calves are bought; no production on the land anymore; fulfilment of cross-compliance regulations by mulching the land once a year; sell all machines not used for mulching; keep all rented land and obtain payments for it; leave buildings empty but maintain them according to legal requirements (particularly relevant for old buildings).

Strategy 3: **Strong growth:** Increase of stock numbers between 30 (larger farms) and 100 percent (DE-160 and DE-160F): major investment into new barns, financed with loans; conversion of existing cash-crops (wheat, other cereals) into corn-silage; if necessary, renting of additional land for corn-silage at local rent prices; additional field work performed by contractors at regional rates; additional work in the cattle herd performed by family members (if available) plus hired workers at local wage rates; adjustment of overhead costs to the number of animals, if appropriate.

Strategy 4: **Moderate growth:** Growth with own financial and labour resources, mainly by change in use or extension of existing buildings; additional corn silage is obtained by converting existing cash crop; if after that not enough land is available, land is rented; additional field work is done with the family labour in case of replacing cash crops by corn silage; field work for additional land rented is contracted out; additional work in the cattle herd is mainly performed by family members; hired labour only in exceptions and with a low share; no investment in additional machinery made; adjustment of overhead costs to the number of animals, if appropriate.

Strategy 5: **Strong growth + improvement of performance:** In this scenario, the growth strategy 3 is complemented by improvements of the daily weight gain (DWG). Maintaining the duration of finishing, the result are higher final weights. This approach was supported to be realistic by the participating advisors and farmers. The additional DWG varies among the farms from zero to 50 g per day depending on their current performance and intensity levels. Higher DWG can be obtained by improved forage quality, ration optimisation by splitting the herd up into homogeneous groups (size effect), improvement of animal comfort (mostly possible in new barns), and a better health status of the calves. To achieve higher DWG, feed costs (mainly for corn silage) were increased accordingly.

6.4 Results of the strategy analysis

The strategies were implemented and calculated using the farm-level simulation model TIPI-CAL. In a first run, a deterministic analysis of the strategies described above was performed. The results are shown in Figure 8 for DE-260.

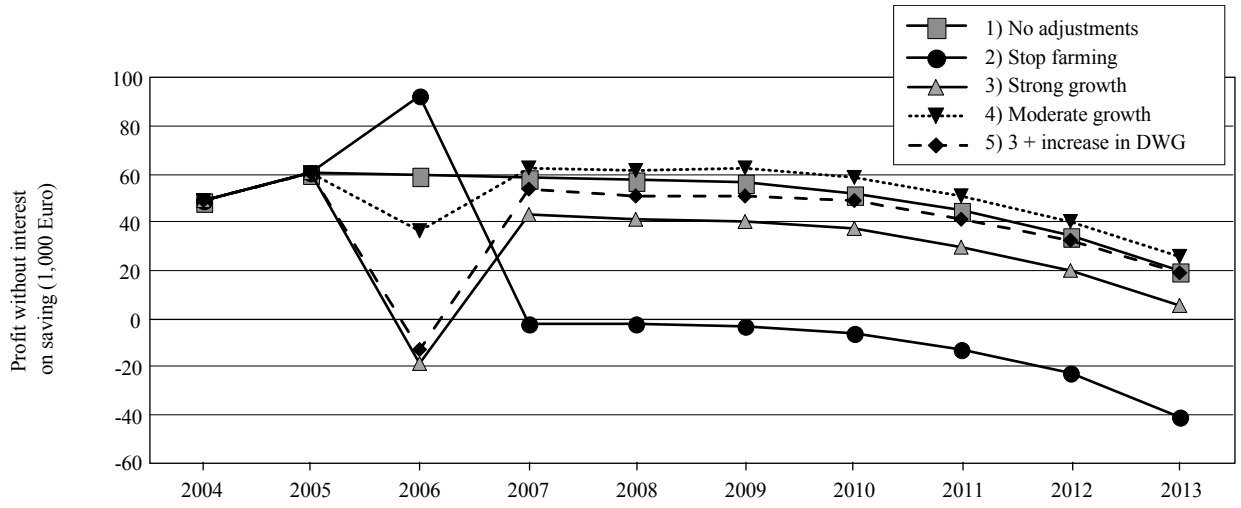
The **first strategy** reflects the MTR scenario from the policy analysis and is used as the reference strategy under MTR-conditions.

The **second strategy** illustrates the consequences of terminating beef farming. In the long-term, it clearly reveals a negative result because termination of farming still has some costs (see chapter 5) that are to be covered while returns from beef finishing are down to zero. The acreage payments alone can not compensate for the costs inhered in this strategy. In the first year of this scenario, a jump in farm income can be observed which results from the sale of the machinery. The accumulating interest on savings that can result from this machinery sale are, however, not reflected here as it is assumed that the money obtained here is not re-invested in the farm. Further, in this strategy almost the complete labour (family and hired) is set free. The cash effect on farm income is almost zero because a) family labour is not reflected in the farm income and b) the share of hired labour is negligibly low. In farms with mainly hired labour, the stop of farm activities in many cases would provide the best strategy as all the wages can be saved (with all social implications this might have).

The **third strategy** is the strong growth strategy. In the first year of implementation, there is a strong drop in farm income due to the purchase of the additional calves (with no beef returns compensating them in this year), additional depreciation for the new buildings and interest payments for the loan that is taken. In the following years, the farm income improves due to the additional beef sales but it does not reach the level of the first strategy due to the high costs involved.

Strategy 4 is the moderate growth strategy with a negative, but less profound, impact in the first year of expansion. In the following years, the farm income becomes even higher than in all other strategies. This is particularly due to the farm specific relatively low investment costs for the barn extension. It should be mentioned that in farms where higher investment cost occur, this strategy is still superior to the strong growth strategy but does not provide higher farm income than strategy 1.

Finally, **strategy 5** represents the strong growth plus an improvement of the daily weight gains which was defined to be 30 g per day to 1,190 g per day, adding between 14 and 16 kg to the final live weight.



Total market receipts (1,000 Euro)										
1) No adjustments	309	344	345	345	345	346	346	346	347	347
2) Stop farming	309	344	320	0	0	0	0	0	0	0
3) Strong growth	309	344	334	586	587	587	587	587	587	587
4) Moderate growth	309	344	337	434	434	434	434	434	435	435
5) 3 + increase in DWG	309	344	340	597	597	597	597	598	598	598
Total government payments (1,000 Euro)										
1) No adjustments	64	53	53	53	53	53	49	43	34	21
2) Stop farming	64	53	51	51	51	51	48	42	32	14
3) Strong growth	64	53	56	58	58	58	55	49	39	27
4) Moderate growth	64	53	53	53	53	53	49	43	34	21
5) 3 + increase in DWG	64	53	56	58	58	58	55	49	39	27
Beef enterprise - animal purchase (1,000 Euro)										
1) No adjustments	165	178	178	178	178	178	178	178	178	178
2) Stop farming	165	178	0	0	0	0	0	0	0	0
3) Strong growth	165	178	319	319	319	319	319	319	319	319
4) Moderate growth	165	178	233	233	233	233	233	233	233	233
5) 3 + increase in DWG	165	178	319	319	319	319	319	319	319	319
Total land rents (1,000 Euro)										
1) No adjustments	8	8	8	8	8	8	8	8	8	8
2) Stop farming	8	8	8	8	8	8	8	8	8	8
3) Strong growth	8	8	15	18	18	18	18	18	18	18
4) Moderate growth	8	8	8	8	8	8	8	8	8	8
5) 3 + increase in DWG	8	8	15	18	18	18	18	18	18	18

Description of scenarios	
1) No adjustments	Production constant, no adjustments
2) Stop farming	Stop of beef farming, sale of machines, mulching by contractor
3) Strong growth	New bull stable for 260 bulls (100% loan-financed), +880 h hired labour, +30 ha corn silage (of which 12 ha with own machines, 18 ha with contractor)
4) Moderate growth	Extension bull barn by 100 animals (100% self-financed), +500 h hired labour, +11 ha corn silage (converted from cash crops), own machines
5) 3 + increase in DWG	Strong growth plus increase of DWG by 30 g per day

Figure 8:
Farm income of a 260 bull finishing farm under different farm strategies

7 Reflecting risk in the analysis

In the next step, stochastic variables were introduced into the calculations to estimate the risk associated with the different strategies and to get a better idea about the probability of losses and certain levels of farm incomes. In particular, the analysis focused on the impact that variations in key prices and productivity indicators have on the

economic result of the farms when applying the five adjustment strategies. For this analysis, the SIMETAR software developed by Richardson, Texas A&M University, was used.

7.1 Definition of key input and output variables (KIV and KOV)

A set of prices and productivity indicators was selected, all of which have a high impact on the profitability of beef finishing. The variables were:

- Beef price
- Calf price
- Animal losses (mortality)
- Daily weight gains (converted into final weights)
- Concentrate/grain price

Further, key output variables (KOV) were defined for the final analysis of the results. The main KOV shown here is the farm income.

7.2 Time series analysis

For the variables selected above, ten years of historic time series data were collected. These data were then analysed in a multiple step process with the objective to obtain distribution functions for each variable. The steps undertaken were (see also Richardson, Klose, Gray, 2000):

- Plotting of the time series data to identify specific events and discontinuities; if necessary, manual correction or introduction of a dummy variable.
- Simple or multiple regression to obtain a trend for each KIV.
- Performing T- or F-Test for significance.
- Calculation of a correlation-matrix and standard-normal distribution matrix for the KIV.
- Creation of a matrix with correlated standard normal distributions.
- Based on this matrix Excel calculates correlated standard normal distributions for each variable.
- Finally, the 'Emprical' Function of SIMETAR is used to generate empirical distribution functions of the KIV reflecting the historical variation of the past (Richardson, Schumann, Feldmann, 2005).
- Albeit technically possible, no assumptions and adjustments were made about future changes in the variations compared with the historical variations. It can, however, be assumed that price volatility will increase with further liberalisation of markets. This would mean that the risk involved in beef production is going to increase.
- The distribution functions for the KIV were then applied to the deterministic strategy analysis by running the model TIPI-CAL plus the SIMETAR add-in for 100 iterations with randomly and simultaneously selected values for each KIV.

The result is 100 single values for each KOV selected which again is used to calculate confidence intervals and cumulated distribution functions for each strategy analysed.

7.3 Results of the risk analysis

Table 2 shows the results of the strategy analysis reflecting risk for the DE-260 farm. Additionally, the results for the Baseline were included to widen the picture. Again, farm income expressed in EURO 1,000 was chosen as the KOV and the last year of simulation (2013) is displayed in the table. The table displays the result of the deterministic model-run already shown in Figure 8 as well as the confidence intervals of the 5 and 95 percentiles as well as the 25 and 75 percentiles. The former indicates the range in which 90 percent of the simulation results would fall in, the latter indicates the range where 50 percent of the simulation values can be found.

The following conclusions can be drawn:

- The *stop farming* strategy only shows a deterministic value because after termination of production none of the KIVs are relevant anymore in the overall result.
- The *moderate growth* strategy shows the highest mean value (deterministic) and appears to be the best adjustment strategy. The two *strong growth* strategies fall behind, even when comparing them with the no adjustment strategy.

Table 2:

Deterministic values and confidence intervals for the farm income of the baseline and five adjustment strategies analysed for a 260 bull finishing farm for the final year of simulation (2013) (Keller, 2006)

Strategy	Deterministic	90 % of the values	50 % of the values
	1,000 Euro	in the range from EUR 1,000 … to EUR 1,000 …	
Baseline (Agenda 2000)	42	16 to 63	31 to 53
1) No adjustments	21	-6 to 43	10 to 32
2) Stop farming	-41	n.r.	n.r.
3) Moderate growth	26	-8 to 55	11 to 41
4) Strong growth	4	-44 to 46	-15 to 24
5) = 4 + increase DWG	18	-32 to 59	-2 to 38

n.r. = not relevant

- The higher the cattle number, the higher the variation of the profit and the risk of running into a loss is. This holds true for all growth strategies.

Figure 9 supports the impression obtained from the analysis presented in Figure 8 and Table 2: the moderate growth strategy appears as being the most promising for this farm and under the assumptions made. The figure shows the cumulative density functions for the farm income of all strategies analysed.

- The *stop farming* strategy shows a loss of approximately EURO 41,000 for the whole distribution
- The *no adjustment* strategy has a probability of generating a loss of less than ten percent but also just a probability of less than five percent of making a profit of more than EURO 40,000.
- The *strong growth* strategy can not generate much higher profit than the no adjustment strategy but it reveals a probability of 45 percent of generating a (huge) loss. The strategy *strong growth* plus *increase in daily weight gains* shows the highest potential profit but also a probability of 30 percent of creating a loss.
- Finally, the *moderate growth* strategy provides a probability of 50 percent of making a profit beyond EURO 30,000 and at the same time a probability of less then ten percent of making a loss.

These findings support the view that can be taken from the deterministic analysis described above. They were further supported by the advisors involved in the definition of the strategies.

With one exception, the moderate growth strategy is also among the most promising strategies for the other farms analysed. The exception is the DE-160F which had a sow enterprise that was replaced by the growing beef enterprise in the simulations. For this farm, continuing beef production without changes is the best alternative.

The results presented here should hold true for most rather specialised and reasonably large sized beef finishing farms with comparable production systems and livestock densities in Germany. For significantly smaller farms as well as for mixed farms and less intensive farms separate analysis should be carried out. It can, however, be assumed that in the absence of economies of scale and with less degree of specialisation the economic situation of the beef enterprise will turn out to be even worse than on the farms analysed here.

7.4 Conclusions about the risk analysis

If the conclusions from the deterministic and the stochastic analysis are similar, one might indeed ask about the benefits of the risk analysis, in particular if the collection of data for the risk analysis creates efforts and costs. The following conclusions can be drawn:

- If animal numbers between two strategies are similar and the farm income shows significant differences, a risk analysis might not be necessary. In this case, the strategy with the higher farm income is most likely the favourable one.
- The same conclusion applies if the farm incomes are similar with significant differences in animal numbers. In this case, the strategy with the lower number of animals usually is less risky and should be favourable.
- If none of the two cases above is true, a risk analysis

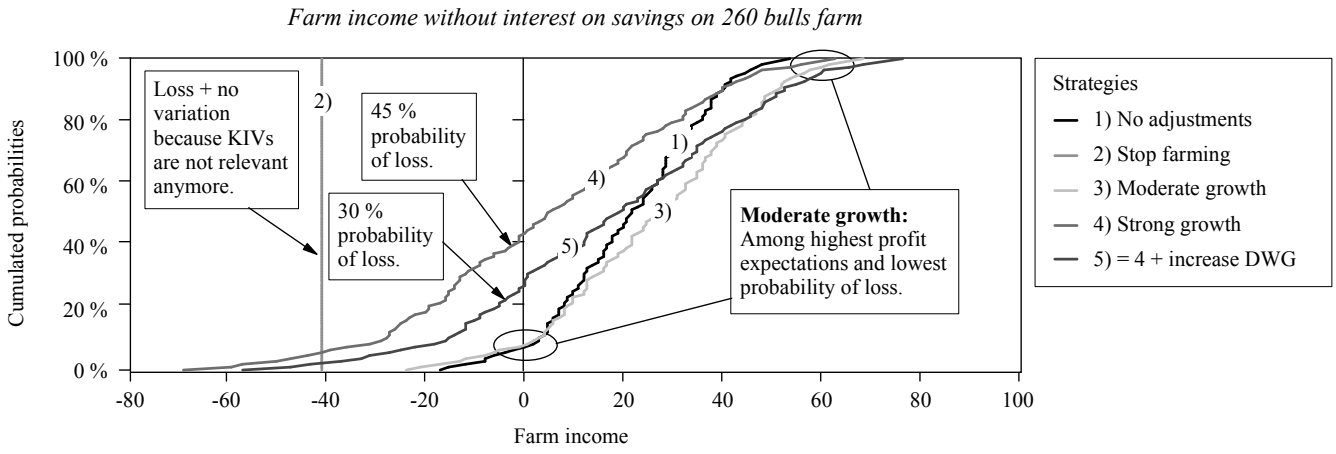


Figure 9:

Cumulative density functions for the farm income of the five adjustment strategies analysed for a 260 bull finishing farm for the final year of simulation (2013) (Keller, 2006)

should be performed to avoid wrong conclusions.
- In any case, risk analysis quantifies the risk involved and the probability of certain events. It is therefore useful additional information for the decision maker.
- Further, risk analysis provides the option to vary the variability of KIV and their implication for the result. This becomes particularly relevant when increases of future price volatility can be expected due to reductions of tariff rates and fluctuations of beef supply due to climate changes.

References

Agra-Europe (2004) 04(35)EN 1-3

Agra-Europe (2004) AgraFacts 30.01.04

Agra-Europe (2004) 04(11)EN 12-14

EU-COM (2005) Overview of the implementation of direct payments under the CAP in member states . version February 2007 [online]. Zu finden in <http://europa.eu.int/comm/agriculture/markets/sfp/ms_en.pdf> [zitiert am 03.04.2007]

Deblitz C (2006) agri benchmark beef report 2006 : benchmarking farming systems worldwide. Braunschweig : FAL, 63 p

Deblitz C, Zimmer Y (2005) A standard operating procedure to define typical farms [online].Zu finden in <http://www.agribenchmark.org/methods_typical_farms.html> [zitiert am 03.04.2007]

DBV (2004) Die Reform der Gemeinsamen Agrarpolitik. Berlin : DBV, 30 p

BMVEL (2004) Meilensteine der Agrarpolitik : Umsetzung der europäischen Agrarreform in Deutschland. Berlin : BMVEL, 153 p

Brömmer J (2005) Produktionssysteme, räumliche Verteilung und Struktur der Rindermast in Deutschland – eine expertengestützte Analyse. Osnabrück : Univ. [Diplomarbeit]

Keller M (2006) Betriebliche Entwicklungsstrategien für ausgewählte Rindermastbetriebe unter Berücksichtigung von Risiko. Göttingen : Univ, 114 p

Richardson JW, Klose SL, Gray AW (2000) An applied procedure for estimating and simulating Multivariate Empirical (MVE) probability distributions in farm-level risk assessment and policy analysis. J Agric Appl Econ 32(2):299-315

Richardson JW, Schumann K, Feldman P (2005) Simetar : simulation for excel to analyse risk. Texas : A&M Univ

ZMP (2007) Marktbericht Vieh und Fleisch, 49(3)

ZMP (2006) Marktbilanz Vieh und Fleisch